

## Metabolic and Glycemia Improvements Occur 3-Months Post Bariatric Surgery in Youth with Type 2 Diabetes

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### Background

Roux-en-Y gastric bypass improves dysglycemia in youth with type 2 diabetes (T2D). However, the early effect of bariatric surgery on metabolism, glycemia, and hormone response to feeding in youth with T2D is unclear, and few data exist regarding the now more commonly performed vertical sleeve gastrectomy (VSG) in youth with T2D.

### Methods

We assessed glycemic control, insulin sensitivity and secretion in youth with T2D before and 3-months after VSG. Fasting labs, anthropometrics, and a 4-hour, frequently sampled liquid mixed meal tolerance test (45g carbohydrates, 14g fat, and 14g protein) were performed. Calculations included glucose, insulin, c-peptide, free fatty acids, GLP-1, and PYY area under the curve (AUC), Matsuda Index, HOMA-IR, and oral disposition index (oDI).

### Results

Fourteen youth (age  $17 \pm 1.7$  years, BMI  $46.8 \pm 5.5$  kg/m<sup>2</sup>, 50% male) were studied. Three months after VSG, youth experienced a  $25 \pm 11$  kg and  $17.9 \pm 6.0\%$  reduction in weight and BMI, respectively ( $p < 0.05$ ). The mean decrease in HbA1c was -1.0 percentage points (95% CI -1.6, -0.47,  $p = 0.0017$ ), with 86% of participants achieving an HbA1c  $\leq 6.0\%$ . Prior to surgery all participants required diabetes medications (1-3 medications); at 3 months only 2 participants required medication (metformin). oDI and HOMA-IR improved by 0.2 units (0.098, 0.31,  $p = 0.0012$ ) and -6.0 units (-11, -1.3,  $p = 0.0169$ ), respectively. Matsuda Index was non-significantly improved by 0.71 units (-0.12, 1.5,  $p = 0.0886$ ). MMTT results showed Glucose and free-fatty-acids AUC significantly decreased a mean of 9,623 units (-15,782, -3,464,  $p = 0.0050$ ) and 12,983 units (-25,059, -906,  $p = 0.0374$ ), respectively, while insulin and c-peptide AUC was unchanged -697 (-8,185, 6,763,  $p = 0.8407$ ), -147 (-809, 515,  $p = 0.6155$ ), respectively. The gut hormone GLP-1 AUC significantly increased 1,929 (-30, 3887,  $p = 0.0500$ ) while PYY was unchanged at 6,556 (-5639, 18,751,  $p = 0.2586$ ).

### Conclusions

Within 3-months, VSG induced notable weight loss and improvements in glycemic control in youth with T2D. These changes were accompanied by improved insulin sensitivity and  $\beta$ -cell function, specifically in the first-phase insulin response. Our ongoing work will continue to investigate durability of the responses and underlying mechanisms.